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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,784	08/08/2006	Yoshihiro Mushika	OKUDP0178US	6306
51921 7590 07/24/2009 MARK D. SARALINO (PAN) RENNER, OTTO, BOISSELLE & SKLAR, LLP 1621 EUCLID AVENUE 19TH FLOOR CLEVELAND, OH 44115				
EXAMINER TAMAL, KARL I				
ART UNIT 2834		PAPER NUMBER		
MAIL DATE 07/24/2009		DELIVERY MODE PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/597,784

Applicant(s)

MUSHIKA, YOSHIHIRO

Examiner

KARL I.E. TAMAI

Art Unit

2834

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 June 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-25, 27-40 and 44-53 is/are rejected.
- 7) ☒ Claim(s) 26, 41 and 43 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 June 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The objection to Figures 10 and 11 is withdrawn.

Specification

2. The amended title of the invention "MICRO ACTUATOR HAVING TILT AND VERTICAL DISPLACEMENT AND DEVICE HAVING SUCH MICRO ACTUATOR" has been entered into the file wrapper. The requirement of a new title is withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 21-25, 27-34, 36-40, 42, and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (US 6906848) and Greywall (US 6690850).
Aubuchon teaches an electrostatic micromirror having a base 60 with a plurality of elastic supports 58 (see figure 3a-3c) intermediate/surrounded by the driving electrodes 78. Aubuchon teaches a plurality of actuators on the base (See figure 6A). Aubuchon teaches the actuator having multiple tilt axis and vertical motion (col. 11, line 10-25).
Aubuchon does not teach the distance between the elastic first point of application and the second point of application being 2L with the spring modulus having the relationship

: $0.5 \leq L^2kz/kx \leq 2.0$ or the distance between each of the plurality of points of application and the position at which the elastic supporting member supports the movable section is $R(m)$ with the spring modulus having the relationship: kz , kx , kry , and R satisfy the relationships of: $1 \leq R^2kz/kx \leq 5$; $1 \leq R^2kz/kry \leq 5$; and $0.67 \leq kx/kry \leq 1.5$ or $1 \leq L^2kz/kx$, more particularly $2 \leq R^2kz/kx$; $2 \leq R^2kz/kry$. Greywall teaches the spacing of the electrodes and the length of the spring L are result effective variables to allow rotation of the moving plate (see col. 6, lines 25-57). Greywall teaches the spring constant (or spring modulus) in terms of L , the length of the spring 218 being result effective. It would have been obvious to a person of ordinary skill in the electrostatic actuator art at the time of the invention to construct the actuator of Aubuchon with the distance between the elastic first point of application and the second point of application being $2L$ with the spring modulus having the relationship : $0.5 \leq L^2kz/kx \leq 2.0$ or the distance between each of the plurality of points of application and the position at which the elastic supporting member supports the movable section is $R(m)$ with the spring modulus having the relationship: kz , kx , kry , and R satisfy the relationships of: $1 \leq R^2kz/kx \leq 5$; $1 \leq R^2kz/kry \leq 5$; and $0.67 \leq kx/kry \leq 1.5$; or $1 \leq L^2kz/kx$ more particularly $2 \leq R^2kz/kx$; $2 \leq R^2kz/kry$ to optimize the rotational support to the moving plate as taught by Greywall.

In regards to claims 22 and 37, Aubuchon teaches the springs 58 supporting the plate 48, including the central portion.

In regards to claim 23 and 38, Aubuchon teaches the mirror is electrically conductive 116 for attraction with the drive electrodes (col. 9- col. 10).

In regards to claim 24 and 39, Aubuchon teaches the electrodes are symmetrical to the axis extending through the elastic members (see figure 4B).

In regards to claim 25 and 42, Aubuchon does not teach a turn back in the spring, but Greywall teaches the serpentine springs with a turnback 218 to provide a compact spring (col. 6 ,line 10). It would have been obvious to a person of ordinary skill in the electrostatic actuator art at the time of the invention to construct the actuator of Aubuchon with the spring having a turnback section to prevent undesirable rotation of moving plate, as taught by Greywall.

In regards to claims 27 and 44, Aubuchon figure 13b shows one end of the driving sections attracting the movable section with the other end becoming more distant from the base.

In regards to claims 30-32 and 48-50, Aubuchon teaches a control section to provide a voltage the drive electrodes corresponding to the desired deflection of the mirror (col. 14, line 8). The steps must includes three or more steps, corresponding to a step for each of the electrode and step for all the electrodes being active for vertical movement to provide a target displace. Aubuchon teaches the control section providing a voltage to provide the desired displacement to the steerable mirrors.(col. 14, lines 1-10).

In regards to claims 33, 34, 51, and 52, Aubuchon teaches light sources 163-165 being reflected by the micromirrors 158, 160, 162 to steer the light beams.

In regards to claim 40, Aubuchon teaches the length of the elastic supporting member is variable with one end connected to the base and the other to the movable

section (see figure 15 A-R and 15A-R') to provide superior support to the various mirror plates(col. 20, line 45-65), but does not teach the relationship $0.8 \leq H/R \leq 1.6$. It would have been obvious to a person of ordinary skill in the electrostatic actuator art at the time of the invention to construct the actuator of Aubuchon and Greywall with the relationship $0.8 \leq H/R \leq 1.6$ to provide superior support to the mirror as taught by Aubuchon.

In regards to claim 47, Aubuchon does not teach the ratio of $0.29 \leq R/P \leq 0.37$. Aubuchon teaches a plurality of millions of microactuators (see figure 6A, col. 12 line19-37) having a pitch. The actuator must have appropriate spacing to operate the microactuators as a lens. It would have been obvious to a person of ordinary skill in the electrostatic actuator art at the time of the invention to construct the actuator Aubuchon and Greywall with the ratio of $0.29 \leq R/P \leq 0.37$ to operate the array of mirrors together as a lens.

5. Claims 35 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aubuchon (US 6906848) and Greywall (US 6690850), in further view of Mushika et al. (Mushika)(WO 021061488 with US 6952304 as a partial translation). Aubuchon and Greywall teach every aspect of the invention except the control section including a movable section displaced in accordance with the wave front information generation section. Mushika teaches the microactuator controlling the mirrors based on the wave front information generation section to correct for disturbances (col. 29, lines 8-23, and figure 8). It would have been obvious to a person of ordinary skill in the electrostatic

actuator art at the time of the invention to construct the actuator of Aubuchon and Greywall with the control section including a movable section displaced in accordance with the wave front information generation section to correction for variations in disturbances such as disk tilt and sticking by fingerprints, as taught by Mushika.

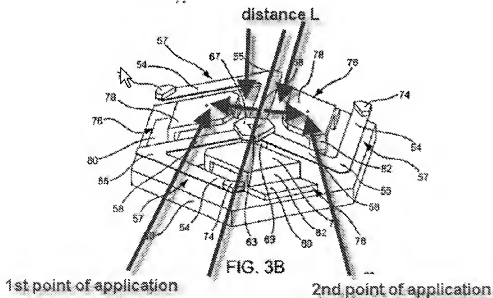
Allowable Subject Matter

6. Claim 26, 41, and 43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

7. Applicant's arguments filed 6/4/09 have been fully considered but they are not persuasive. Applicant's arguments regarding the elastic support being support member supporting the movable section at a position intermediate the first and second points of application of the driving forces, as recited in independent claim 21 is not persuasive. The driving forces are provided the electrodes 78, with the elastic hinges/springs 58 occupying the intermediate position between the electrodes, where the first point is merely a point of application on the electrode L from the hinge and a second point is merely a point of application on the electrode L from the hinge on the adjacent electrode (see figure below). Aubuchon does not teach the distance between the elastic first point of application and the second point of application being $2L$ WITH the spring modulus having the relationship : $0.5 \leq L^2kz/kr \leq 2.0$. Greywall teaches the spacing of the

electrodes (2x in figure 2) and the length of the spring L are result effective variables to allow rotation of the moving plate (see col. 6, lines 25-57). The spring constant or spring modulus is a result effective variable which is defined by L(of Greywall) to allow the appropriate response forces between the stationary electrodes and moving plate actuator. As a result effective variable it would be obvious to optimized to enhance the efficiency of the mirror device. Another example of the length of the spring in regards to the spring constant is Novotny (US 6963679)(col. 13, lines 15-25), where the variable spring lengths/constants provide optimizes the resonance and vibration behavior of the springs/hinges. Therefore, Greywall suggests optimizing the result effective variables of Aubuchon of the spacing (Applicants L and R) of the elastic support, the electrodes, and the spring modulus/constant of the supports to provide the best response in terms of force and movement.



Aubuchon fig 3b.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl I.E. Tamai whose telephone number is (571) 272 - 2036.

The examiner can be normally contacted on Monday through Friday from 8:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mrs. Quyen Leung, can be reached at (571) 272 - 8188. The facsimile number for the Group is (571) 273 - 8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Karl I Tamai/
PRIMARY PATENT EXAMINER
July 24, 2009